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# DEPARTMENT OF FISH & GA ME

Jerry M. Conley. Director

McCall Summer Chinook Salmon Hatchery

Annual Report

October. 1, 1980 - September 30, 1981 Project 03-68-371

by

Bill G. Hutchinson
Fish Hatchery Superintendent II

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# McCall Summer Chinook Salmon Hatchery

## ABSTRACT

In April 1981, 248,926 summer chinook smolts were released in the South Fork Salmon River, near Warm Lake. These were the first fish raised entirely at the new McCall Hatchery.

A total of 92,116 eggs were collected from returning adults at the South Fork trap during 1980. In addition, 92,621 eyed-eggs were received from Dworshak National Fish Hatchery in October 1980. Approximately 148,123 resultant fingerlings are on hand at the end of the fish year for release in April 1982. Three separate lots of fish were coded-wire tagged, with one lot being vaccinated against Vibrio anquillarum.

During July, August and September 1981, 124 1-ocean fish and 400 2- and 3-ocean fish were collected at the South Fork trap. Approximately 43% of this run was released upstream for natural spawning. A total of 482,941 eggs were collected from 124 females and at the end of the fish year, 354,393 eyed-eggs are on hand.

During August and September 1981, 647,555 spring chinook eggs were received from fish trapped on the Salmon River near Stanley. Resultant fish will be reared at McCall, then released back in the Salmon River in 1983. These fish will, hopefully, become the nucleus for the proposed Sawtooth Hatchery.

Several epizootics manifested themselves in the chinook during the year. Bacterial Kidney Disease was found and treated with Erythromycin thiocyanate. The infestation of Trichophyra sp. was successfully treated with acetic acid, but a reinfestation occurred and a second treatment was not administered. A systematic bacterial infection of Aeromonas sue. appeared and was successfully treated with TM-50. The "Spring Thing" returned again this year and to date the causative agent remains unidentified.

Author:

Bill G. Hutchinson
Fish Hatchery Superintendent II

## OBJECTIVES

The objectives of the McCall Hatchery are to:

1. Raise 1,000,000 summer chinook smolts for release in the South Fork Salmon River.

2. Trap and spawn adult salmon returning to the South Fork Salmon River.

3. Evaluate fish rearing capabilities of the new McCall facility.

4. Raise and distribute various species of fish for the State of Idaho, when facilities are available (Chapman 1981).

## INTRODUCTION

The McCall Summer Chinook Hatchery was constructed in 1979-80 as part of the Lower Snake River Compensation Plan (LSRCP). The LSRCP was authorized by Congress to compensate Idaho, Oregon and Washington for losses of fish and wildlife, caused by the Lower Snake River Projects (Ice Harbor, Lower Monumental, Little Goose and Lower Granite Locks and Dams). This plan will provide hatchery capacity for the rearing of 9,160,000 chinook salmon smolts, 6,750,000 steel head smolts and 93,000 pounds of resident sport fisheries. The McCall Hatchery is the first of these hatcheries to be constructed as partial fulfillment of the LSRCP.

McCall Hatchery was constructed by the U.S. Army Corps of Engineers, is funded by the U.S. Department of Interior, Fish and Wildlife Service and is operated by the Idaho Department of Fish and Game. It is located within the city limits of McCall, Idaho on the North Fork Payette River, approximately 1/4 mile downstream from the Payette Lake regulating dam. Hatchery water is obtained from Payette Lake via a 36 inch underground pipeline. Two inlets; one at the surface near the dam, the other at a depth of 50, feet, approximately 1,500 feet from shore, provide the capability of obtaining the best water temperature available (Appendix A). At maximum capacity the facility requires 20 cfs of water. The fish rearing facilities of the hatchery include: 26 eight-tray stacks of Heath incubators, two,l.75' x 15.5' fiberglass Heath troughs, 14 4' X 40' concrete vats, two 42' X 200' gravel bottom ponds and one 15' X 101' collection basin. The design capacity of the hatchery is for production of 1,000,000 smolts at approximately 17.0 fish per pound.

An adult trapping and spawning facility is located on the South Fork Salmon River, near Cabin Creek, approximately 26 miles east of Cascade, Idaho. This facility is equipped with a remoVable fish weir, fish ladder, trap, two 10' X 88' adult holding ponds and a covered spawning area. Water is supplied from the South Fork Salmon River through a 33 inch diameter underground pipe. The facility is designed to hold 750 adult summer chinook. A portion of the returning adults are released above the fish weir for natural spawning. After spawning, the green eggs are transferre to McCall for incubation.

## GENERAL FISH CULTURE AND HEALTH

### Loading

Until sufficient quantities of eggs can be obtained to attain maximum production, incubators are loaded below desiºned levels (2,560-3,840 eggs per tray). Eyed-eggs

are shocked after accumulating approximately 500 thermal units (TUs) and mortality is removed by using the salt flotation method described by Lietritz and Lewis (1974).

After accumulation of approximately 1,650 TUs, fry are transferred to the vats. Vat rearing volumes are established and changed by setting screens and drop gates at various distances and depths. Fish are transferred to the outside rearing ponds when they are approximately 250 fish per pound. Fish densities are maintained at or below the Maximum Density Index (MDI) or Pond Loading Index (PLI) (Klontz 1979).

Hygiene

Eggs received at McCall are disinfected in a 1:300 solution of Wescodyne for ten minutes. A 0.05% concentration of sodium bicarbonate is added as a buffering agent against the acidifying effects of Wescodyne **in** soft water (Wood (1974). An ultraviolet water purification system is used on incubation water and for added protection against fungal invasion, eggs are periodically administered malachite green flushes.

Hatchery vats are cleaned daily and brushes and nets, designated for each vat, are disinfected **in** a 600 ppm Benzalchonium Chloride (50%) solution after each use. Mortali is collected daily, recorded and frozen for proper disposal. The outside gravel bottom rearing ponds have a concrete apron covering the last 30 feet which is cleaned on an "as needed" basis by means of a vacuum system with eventual discharge into the settling pond. Pond mortality is disposed of in the same manner as that of the vats.

Inventories

Fish are inventoried on the 1st and 15th of each month. Length/weight relationships are determined, feeding levels adjusted, MDI and PLI are calculated and necropsis are performed on a few fish to monitor general fish health.

BROOD YEAR 1979

Production

On 6 and 7 April, 1981, 248,926 (14,200 pounds) summer chinook smolts were released in the South Fork Salmon River, near Warm Lake (Table 1). They averaged 17.53 fish per pound and 134 mm (5.28 in) in length. These smolts originated from eggs taken from adults collected at Lower Granite Dam in July 1979 and trucked to Dworshak National Fish Hatchery for holding and spawning. After eyeing, the eggs were shipped to McCall where resultant fry became the first summer chinook to be raised entirely at the new McCall Hatchery.

Conversion

A total of 12,500 pounds of OMP II fish feed was fed to produce 7,285 pounds of fish. This resulted in a conversion ratio of 1.72 (Table 2).

Disease

As reported in last year's annual report (Wimer 1980), the gill parasite Trichophyra sp. was successfully eliminated, in bioassays, with the treatment of a 1:250 (4,000 ppm) glacial acetic acid (99.5%) one minute dip. In October 1980, the entire 1979 brood year (approximately 300,000) was administered this rather harsh treatment. Post-treatment examinations revealed good success in eliminating this parasite. However, a substantial mortality (2.1%) resulted from the treatment and

necropsis in subsequent months revealed the presence of the parasite in increasing numbers. The gravel in the outside rearing ponds provided excellent habitat for the Trichophyra and reinfection resulted. A request has been made to provide concrete bottoms to our outside ponds.

In January, clinical signs of Bacterial Kidney Disease (BKD) appeared in a few of the presmolts. The Corynebacterium sp. bacteria was positively identified by Joe Lientz (U.S. Fish and Wildlife Area Biologist) and personnel from the University of Idaho by means of the fluorescent antibody test (FAT). These tests revealed "extremely" light concentrations of the bacterium. In an effort to head off any potential problems, fish were given feed top-dressed with Gallimycin-50 (Erythromycin) thiocyanate) at 4.5 grams active ingredient per 100 pounds of fish for 21 days. Blood serum analysis following treatment indicated success in introducing the drug into the blood system. Mortality during the "outbreak" was very light (less than 0.4%) but when 1-ocean males return in 1982 they will be thoroughly inspected for BKD, and if found in significant quantities, an inoculation program will be administered to the 2- and 3-ocean fish when they return in 1983 and 1984.

## BROOD YEAR 1980

### Production

On 6 and 17 October 1980 a total of 92,621 eyed summer chinook eggs were received from Dworshak NFH. These eggs were from adults collected at Lower Granite Dam from 28 June to 3 July 1980 and transported to Dworshak for holding and spawning. A total of 161 females and 80 males were collected but a suspected adverse reaction to the Erythromycin injection administered at the time of selection, resulted in severe mortality and only 28 females survived to spawn.

In addition, 92,116 eggs were taken at the South Fork spawning station, giving us a total of 184,737 eggs to begin our 1980 brood year. At the end of the fish year approximately 148,123 fingerlings (4,232 pounds at 35 fish per pound) are on hand for release during April 1982 {Table 1).

On 14 July 1981, 500 chinook fingerlings (five pounds) were transferred to Merle Brusven (University of Idaho) for completion of an aquatic insect feeding study on the South Fork Salmon River, near Stolle Meadows (Table 1). The fish were contained within the study area but were to be released upon completion of the study, at summers end.

### Conversion

A total of 6,718 pounds of OMP II and OMP II Double Vitamin Pak fish feed was fed to produce 4,237 pounds of fish. A conversion ratio of 1.59 was attained for this brood year (Table 2).

### Disease

During the course of the year several epizootics appeared in our 1980 brood year fish. In January, we observed floating swim-up fry with visible gas bubbles in the body cavity. Gas Bubble Disease, caused by supersaturated levels of nitrogen in the water was suspected and later confirmed by Dave Owsley (Dworshak NFH). Nitrogen levels above 104% were experienced through mid-June and although no major losses were attribute to this disease a nitrogen degassification system for hatchery building water is being considered.

Table 1. Fish production October 1, 1980 - September 30,1981.

| Brood Year | Numbers Produced | Pounds Produced (net) |
|---|---|---|
| 1979 | 248,926 | 7,285 |
| 1980 (on hand) | 148,123 | 4,232 |
| 1980 (planted) | 500 | 5 |
| Totals | 397,549 | 11,522 |

Table 2. Conversion and cost per pound of fish produced.

| Brood Year• | lbs of Fish Produced | Pounds Feed Fed | Cost | Conversion | Fish Feed Cost/lb Produced |
|---|---|---|---|---|---|
| 1979 | 7,285 | 12,500 | $4,250.00 | 1.72 | $ 0.583 |
| 1980 | 4,237 | 6,718 | 2,472.57 | 1.59 | 0.584 |
| Totals | 11,522 | 19,218 | $6,722.57 | 1.67 | $ 0.5835 |
| Cost per pound of fish produced excluding capital outlay. | | | $8.758 | | |

In February, signs of a systemic bacterial infection appeared. Microscopic investigations confirmed a motile Aeromonas sp.. bacteria in the G.I. tract. A treatment of TM-50 at four grams active ingredient per 100 pounds of fish for 18 days was administered. Mortality subsided following treatment, but this bacterial agent continued to appear in a few fish until May.

A third epizootic manifested itself in late March and continued until late May. What is commonly referred to as our "Spring Thing" was suspected. Affected fish exhibited: flashing, hyperplasia of the gills, lethargy, no feeding response, some spiraling along the long axis, pinched-in appearance to the abdomen, a yellowish fluid **in** the gut and death as the end result. Samples of clinically healthy and moribund fish were sent to pathologists in Montana and Washington for diagnoses. Nutritional Gill Disease and Bacterial Gill Disease (caused by an atypical bacterial species) were diagnosed and a change **in** feed was recommended. All fish were placed on OMP II Double Vitamin Pak feed but no significant differences were observed. The causative agent to this mysterious disease remains unidentified.

A light infestation of the gill parasite Trichophyra sp. was discovered during August. No mortality was attributed to this outbreak. Due to the harsh treatment required to eliminate this parasite and the fact that our gravel bottom ponds are the source of reinfection, no action was taken.

## ADULT RETURNS AND BROOD YEAR 1981

### Trapping and Spawning

The trapping of returning adults to the South Fork Salmon River began on July 8 and terminated on September 14. During this period, 400 2- and 3-ocean chinook and 124 1-ocean fish were trapped (Figure 1). Of these, 155 2- and 3-ocean fish and 72 1-ocean fish were released upstream for natural spawning. Total lengths of all fish were recorded at time of release or spawning (Figure 2). Ten females and 27 males died during the holding period to unknown causes.

Of the returning adults, 65 had adipose fins absent, indicating the possible presence of a coded wire tag. Snouts from these fish were collected after spawning and sent to Rod Duke (IDFG Senior Fishery Research Biologist) for tag recovery and code identification (Table 3). Three adults contained National Marine Fisheries Service jav tags, which were verified as having been tagged as returning adults at Lower Granite Dam

Spawning began on August 11 and terminated on September 15. During this period, 12 females were spawned yielding 482,941 eggs, an average of 3,395 eggs per female (Table 4

No injections of Erythromycin were administered and all spawned-out fish suitable for human consumption were cleaned, packaged and frozen and to be given to charity.

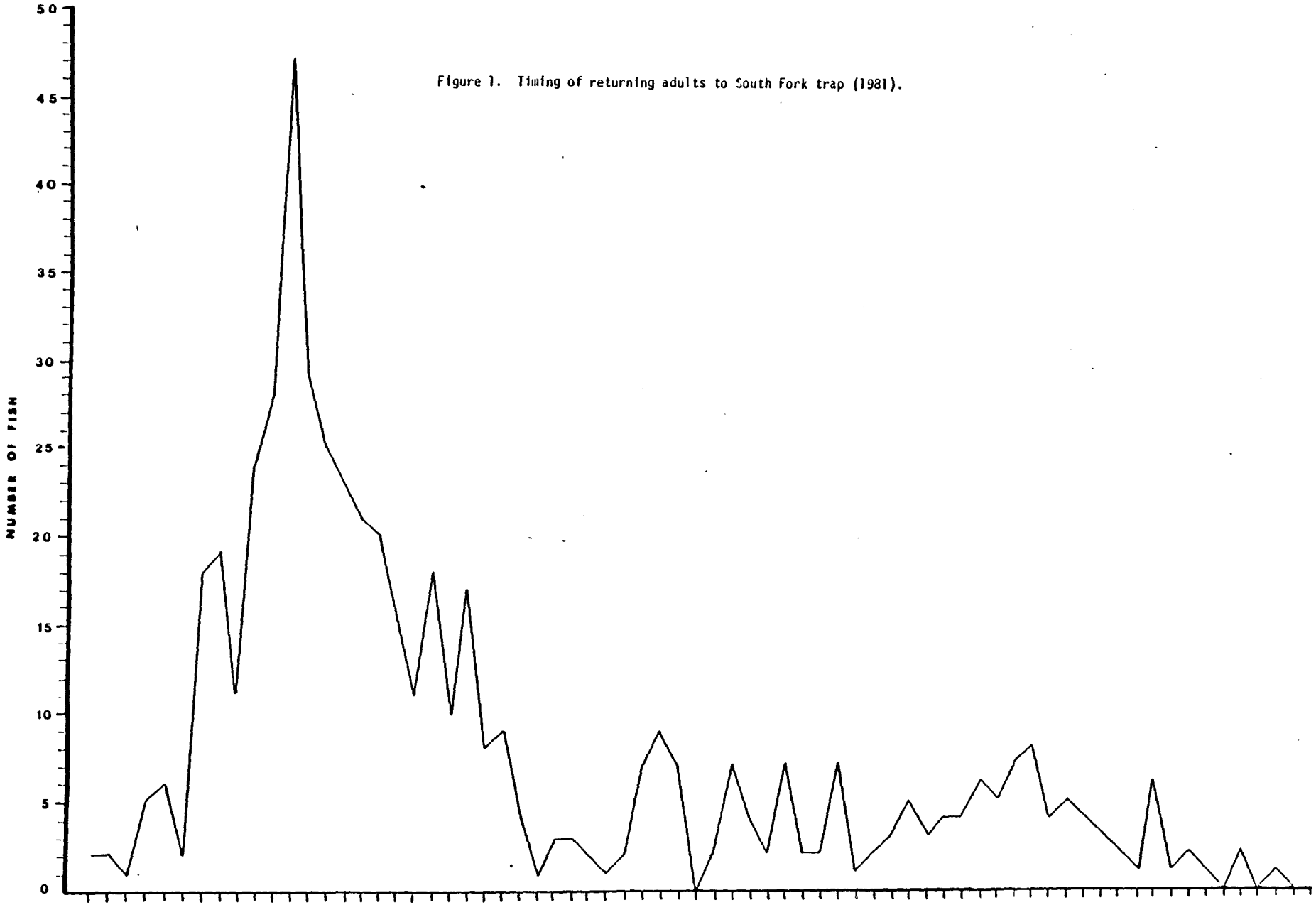
As 17 spawned fish showed gross visible signs of BKD, all eggs taken at the South Fork were water hardened for 1 hour in a 2 ppm (active ingredient) concentration of Erythromycin (Gallomycin PFK, Abbot).

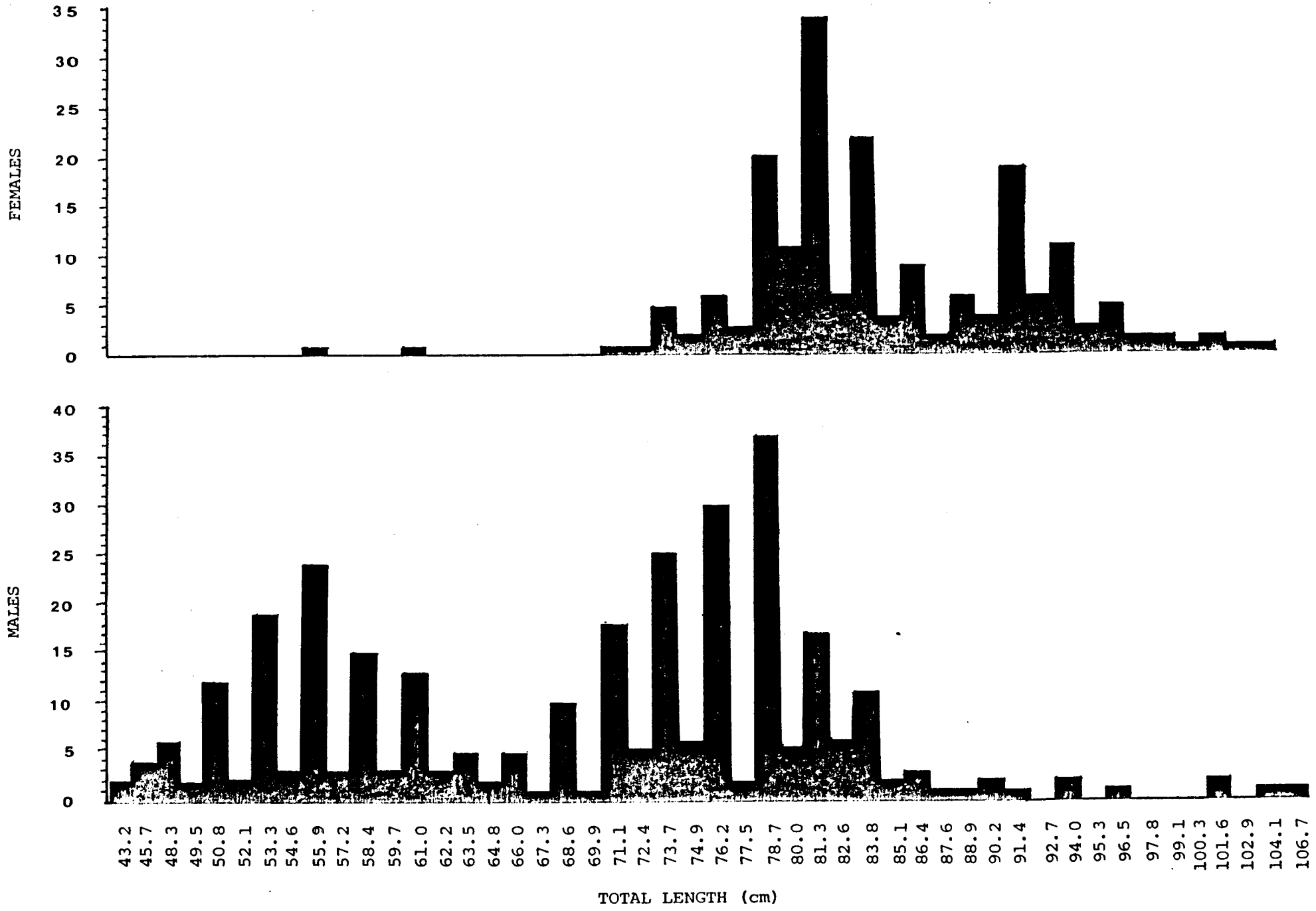
## SPECIAL STUDIES

### Vibrio Vaccination, Coded Wire Tagging

On February 11, hatchery personnel along with Harold Ramsey (IDFG Fish Pathologist)

Figure 1. Timing of returning adults to South Fork trap (1981).




FEMALES
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48.3
49.5
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53.3
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55.9
57.2
58.4
59.7
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62.2
63.5
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67.3
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69.9
71.1
72.4
73.7
74.9
76.2
77.5
78.7
80.0
81.3
82.6
83.8
85.1
86.4
87.6
88.9
90.2
91.4
92.7
94.0
95.3
96.5
97.8
99.1
100.3
101.6
102.9
104.1
106.7
TOTAL LENGTH (cm)

Table 3. Coded wire tag recovery data.

| mm | Code 323 1978 Release (3-ocean) Males | Code 323 1978 Release (3-ocean) Females | Code 323 1978 Release (3-ocean) Sex Unk | Code 325 1979 Release (2-ocean) Males | Code 325 1979 Release (2-ocean) Females | Code 325 1979 Release (2-ocean) Sex Unk | Code 415 * 1979 Release (2-ocean) Females |
|---|---|---|---|---|---|---|---|
| 401 | | | 1 | | | | |
| 648 | | | | 1 | | | |
| 711 | | | | 1 | | | |
| 737 | | | | | 1 | | |
| 762 | | | | | | | 1 |
| 775 | | | | | 1 | | |
| 787 | | | | 3 | 4 | | |
| 800 | | 1 | | | 1 | 1 | |
| 813 | | 1 | | 2 | 8 | | |
| 825 | | | | | 2 | | |
| 838 | | | | 4 | 5 | | |
| 851 | | | | | 2 | | |
| 864 | | | | | 1 | | |
| 902 | | 1 | | | 1 | | |
| 914 | | 3 | - | | | | |
| 927 | | 2 | | | | | |
| 940 | | 2 | | | | | |
| 965 | | 3 | | 1 | | | |
| 1016 | 1 | | | | | | |
| 1029 | | 1 | | | | | |
| 1041 | | 1 | | | | | |
| 1067 | 1 | | | | | | |

* Fish released from Rapid River Hatchery 3/15/79

Note: No information received on seven additional snouts sent in for tag recoverv.

and Bill Doerr (IDFG Fish Hatchery Supt. I) vaccinated approximately 42,000 (1979 brood year) chinook presmolts agains Vibrio anquillarum. The fish were vaccinated with a Tavolek Vaccinator using the shower method. Bacterine obtained from Tavolek was used and an exposure time of 2-5 seconds was administered. A vaccinate-control group of approximately 50,000 was run through the machine without the use of bacterine, while a third group of about 42,000 was used as an overall control and was not run through the vaccinator. All three groups were differentially coded wire tagged, by Rod Duke and his crew, thus enabling us to determine the results of the vaccination program.

Hatching Jar vs. Heath Incubators

The study to determine any differences between fish hatched in Heath incubators and those hatched in a 12 inch PVC hatching jar left us with inconclusive results. Two groups of eggs from the same lot were used, but equal vat loading densities were not maintained and both groups were not subjected to identical conditions. Therefore, results should not be construed as definitive differences between hatching jars and Heath incubators but rather as a basis for further investigations. Mortality, lengths and weights (fish per pound) were recorded (Table 5). Results indicate a slightly higher mortality in the Heath incubator fish but an overall larger fish. Again, too many variables appeared in this study for results to be representative.

Vat Color

Hatchery vats were originally painted with a white epoxy paint, which provided a high degree of visibility yet caused adverse reactions in fish response. Any movement near the vats would send the fish into the nearest corner. To provide a more subdued environment, all vats were repainted with a grey epoxy paint. Fish reared in these vats appeared more subdued, were less frightened by sudden movements and were better distributed throughout the vat.

## MISCELLANEOUS ACTIVITIES

Sawtooth Spring Chinook 1981

A fish trap and weir were installed in the Salmon River, near Stanley, for the purpose of trapping adult spring chinook salmon (See Sawtooth Annual Report 1981 - Moore). The returning adults were collected by IDFG personnel and held in the Decker Flat holding pond until ready to spawn. A total of 647,555 green eggs were transported by air to McCall Hatchery, where they will be hatched and reared (Table 6). Resulting smolts will be released back in the Salmon River in 1983 where they will hopefully become the nucleus for the proposed Sawtooth Hatchery.

Hatchery Completion Contract

A "clean-up" contract to correct deficiencies at the South Fork spawning station and the Hatchery is in the process of being developed. The contract is to be completed next year and hopefully will be the last needed to correct deficiences here at McCall.

Water Quality Analysis

Each week, 95 ml water samples from both the surface and deep inlets are taken.

Table 4. South Fork Salmon River egg take and percent eye-up (1981).

| Lot # | Date | Eggs taken | Eggs eyed | % Eye-up |
|---|---|---|---|---|
| 1 | 8/11/81 | 22,922 | 4,672 | 20.4 |
| 2 | 8/14/81 | 25,848 | 3,888 | 15.0 |
| 3 | 8/17/81 | 31,356 | 12,168 | 38.8 |
| 4 | 8/21/81 | 38,830 | 22,027 | 56.7 |
| 5 | 8/25/81 | 88,403 | 72,051 | 81.5 |
| 6 | 8/28/81 | 68,108 | 63,738 | 93.6 |
| 7 | 9/1/81 | 85,731 | 75,485 | 88.1 |
| 8 | 9/4/81 | 49,115 | 45,621 | 92.9 |
| 9 | 9/9/81 | 53,712 | 38,121 | 71.0 |
| 10 | 9/11/81 | 9,216 | 8,280 | 89.8 |
| 11 | 9/15/81 | 9,700 | 8,342 | 86.0 |
| Totals | | 482,941 | 354,393 | 74.9 |

Number females spawned: 124

Average eggs per female: 3,895

Table 5. Comparison of weight, length and mortality between fish incubated in hatching jar versus Heath incubators.

| Date | Hatching | | | Heath Incubators | | |
|---|---|---|---|---|---|---|
| | Fish/lb | Length(mm) | %Mortality | Fish/lb | Length(mm) | %Mortality |
| 12/26/80 | 1,283 | ≈25.4 | - | 1,283 | ≈25.4 | - |
| 1/2/81 | 1,165.2 | ≈25.4 | 0.59 | 1,207.1 | ≈25.4 | 0.01 |
| 1/16/81 | 1,043.8 | ≈25.4 | 0.60 | 1,032.8 | ≈25.4 | 0.50 |
| 2/2/81 | 930.5 | 38.97 | 0.69 | 961.0 | 38.26 | 0.61 |
| 2/15/81 | 895.3 | 38.97 | 1.38 | 842.1 | 38.26 | 0.46 |
| 3/1/81 | 866.9 | 42.27 | 0.22 | 779.8 | 41.7 | 0.26 |
| 3/17/81 | 748.5 | 42.27 | 0.14 | 685.1 | 41.7 | 0.15 |
| 4/1/81 | 703.9 | 41.5 | 0.23 | 640.5 | 43.8 | 0.14 |
| 4/16/81 | 573.3 | 41.5 | 0.38 | 585.3 | 43.8 | 0.44 |
| 5/6/81 | 348.6 | - | 1.08 | 313.8 | - | 1.30 |
| 5/18/81 | 335.8 | - | 2.72 | 342.7 | - | 3.79 |
| 6/1/81 | 207.9 | 51.33 | 2.03 | 210.0 | 54.1 | 3.29 |
| 6/18/81 | 236.9 | 51.33 | 1.20 | 172.9 | 54.1 | 2.31 |
| Overall Mortality | | | 10.7% | | | 12.3% |

These samples are acid-fixed with five ml of nitric acid and sent to the Department of Lands, Bureau of Mines and Geology, Moscow, Idaho for analysis of heavy metals concentration (Appendix B).

Visitors

Over 2,000 visitors signed our guest register and it is felt that over 3,500 people visited the hatchery during the year. Organized tours were given to Greenleaf Friends Academy, Long Valley Gardeners, Duck Creek YACC, McCall Cub Scouts, engineers from Corps of Engineers, as well as several classes from Meadows Valley and McCall-Donnelly kindergarten, grade and high schools. The completion of our visitor center, with its story board and self-guided tour, enabled the hatchery staff to spend more time with their fish cultural duties rather than answering visitors' questions.

Hatchery Dormitory

For over four months the dormitory was used as a temporary residence for Conservation Officers filling the vacant Lake Fork Patrol District. In additio Department personnel utilized this facility for professional and personal use. Accomodations were also made to Department groups for authorized meetings.

Table 6. Sawtooth egg take and percent eye-up (1981).

| Lot # | Date | Eggs taken | Eggs eyed | % Eye-up |
|---|---|---|---|---|
| 1 | 8/11/81 | 12,528 | 9,744 | 77.8 |
| 2 | 8/14/81 | 24,840 | 16,920 | 68.1 |
| 3 | 8/17/81 | 16,128 | 10,800 | 67.0 |
| 4 | 8/20/81 | 11,592 | 11,340 | 97.8 |
| 5 | 8/24/81 | 55,219 | 47,770 | 86.5 |
| 6 | 8/27/81 | 75,429 | 69,612 | 92.3 |
| 7 | 8/31/81 | 167,986 | 162,435 | 96.7 |
| 8 | 9/4/81 | 141,742 | 135,735 | 95.1 |
| **9** | 9/8/81 | 142,091 | 139,644 | 98.3 |
| Totals | | 647,555 | 603,000 | 93.1 |

Number females spawned: 160

Average eggs per female: 4,047

ACKNOWLEDGEMENTS

The hatchery crew would like to thank the following people for their respective contributions during the year:

Harold Ramsey, IDFG, Hagerman; Joe Lientz, USFWS, Dworshak; Charlie Smith, USFWS, Bozeman; Dave Owsley, USFWS, Dworshak; Steve Roberts, Washington Department of Game, Wenatchee; and G.W. Klontz, DVM, U of I, Moscow, Idaho for investigations during disease outbreaks.

Charlie Knowles and Fred Hutchison, Department of Lands, Bureau of Mines and Geology, Moscow, Idaho for heavy metals analysis of hatchery water.

John Hanson, USFWS, Boise; Roy Taylor and Phil Jeppson, CH2M-Hill, Boise for assistance with construction deficiencies.

Wayne Olson, USFWS, and the crew at Dworshak NFH for their efforts in holding and spawning the 1980 returning adults.

Gary Willard, Joe McMichaels, Bob Burger and Jim Douglas, U.S. Army Corps of Engineers for their continuing help during the construction and "clean-up" phase of the hatchery and satellite facility.

Hatchery staff during the year included: Larry R. Wimer, Fish Hatchery Superintendent II; Bill G. Hutchinson, Fish Hatchery Superintendent II, Pat Chapman, Fish Hatchery Superintendent I; John Thorpe, Fish Culturist; Jeff Lang, Biological Aide; and laborers Thom Otto and John Kirk.

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# APPENDICES

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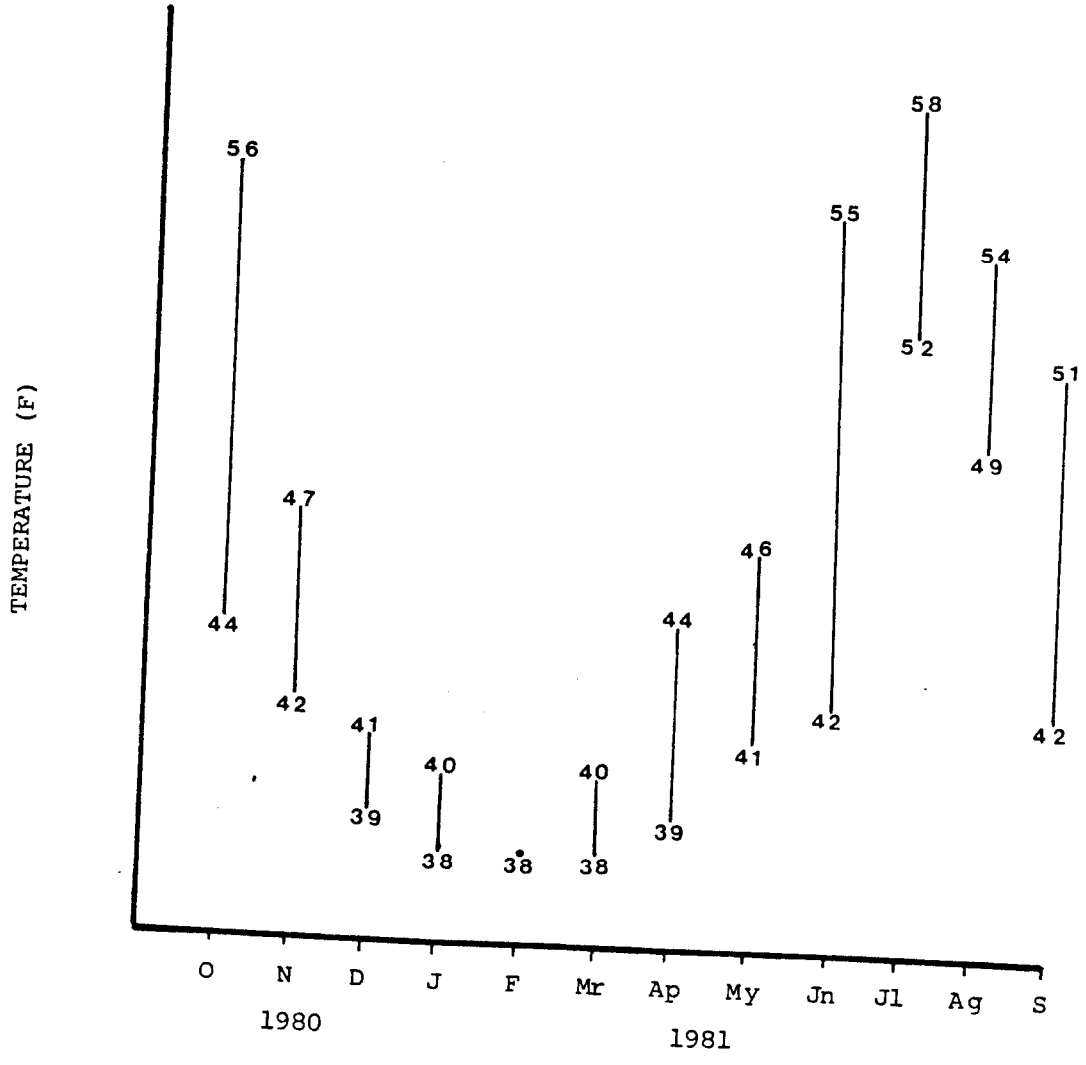


Appendix A. Monthly temperature ranges of hatchery water

Appendix B.

McCALL FISH HATCHERY WATER ANALYSIS

CONCENTRATION (ug/ml)

| SAMPLE DATE | INLET | Cd* | Ca** | Cu*** | Fe**** | Pb** | Mg** | Mn*** | K** | Na** | Zn*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/7/80 | Surface | <0.005 | 2.20 | <0.01 | 0.03 | <0.05 | 0.70 | 0.01 | 0.40 | 1.65 | <0.01 |
| 10/7/80 | Deep | " | 3.30 | " | 0.15 | " | 0.65 | " | 0.40 | 1.70 | " |
| 10/14/80 | Surface | " | 2.15 | " | 0.02 | " | 7.45 | " | 0.45 | 1.75 | " |
| 10/14/80 | Deep | " | 2.20 | " | 0.04 | " | 1.70 | " | 0.45 | 1.70 | " |
| 10/20/80 | Surface | " | 2.05 | " | 0.02 | " | 0.85 | " | 0.40 | 1.65 | " |
| 10/20/80 | Deep | " | 2.15 | " | 0.03 | " | 0.75 | " | 0.50 | 1.80 | " |
| 10/27/80 | Surface | " | 2.20 | " | 0.19 | " | 0.80 | " | 0.45 | 1.75 | " |
| 10/27/80 | Deep | " | 2.25 | " | 0.82 | " | 0.75 | " | 0.40 | 1.70 | 0.01 |
| 11/3/80 | Surface | " | 2.45 | " | 0.25 | " | 0.75 | " | 0.45 | 1.70 | 0.01 |
| 11/3/80 | Deep | " | 2.15 | " | 0.19 | " | 0.70 | " | 0.45 | 1.65 | <0.01 |
| 11/10/80 | Surface | " | 2.15 | " | 0.04 | " | 0.75 | " | 0.40 | 1.65 | " |
| 11/10/80 | Deep | " | 2.15 | " | 0.04 | " | 4.70 | " | 0.40 | 1.15 | " |
| 11/17/80 | Surface | " | 2.55 | " | 0.32 | " | 1.45 | " | 0.50 | 1.25 | " |
| 11/17/80 | Deep | " | 2.20 | " | 0.04 | " | 0.80 | " | 0.40 | 1.10 | " |
| 11/26/80 | Surface | " | 2.20 | " | 0.05 | " | 0.75 | " | 0.45 | 1.10 | " |
| 11/26/80 | Deep | " | 2.20 | " | 0.07 | " | 0.70 | <0.01 | 0.45 | 1.00 | " |
| 12/3/80 | Surface | " | 2.30 | " | 0.05 | " | 0.70 | 0.01 | 0.45 | 1.20 | " |
| 12/3/80 | Deep | " | 2.30 | " | 0.26 | " | 0.80 | 0.08 | 0.50 | 1.20 | 0.01 |
| 12/8/80 | Surface | " | 2.30 | " | 0.05 | " | 0.65 | 0.02 | 0.40 | 1.10 | <0.01 |
| 12/8/80 | Deep | " | 2.25 | " | 0.04 | " | 0.65 | 0.02 | 0.55 | 1.25 | 0.01 |
| 12/15/80 | Surface | " | 2.25 | " | 0.09 | " | 5.95 | 0.03 | 0.45 | 1.15 | <0.01 |
| 12/15/80 | Deep | " | 2.20 | " | 0.04 | " | 1.45 | 0.01 | 0.45 | 1.20 | " |
| 12/30/80 | Surface | " | 2.40 | " | 0.13 | " | 0.85 | 0.01 | 0.45 | 1.25 | " |
| 12/30/80 | Deep | " | 2.25 | " | 0.06 | " | 0.70 | 0.02 | 0.50 | 1.20 | " |

Appendix B. (Con't)

| SAMPLE DATE | INLET | Cd* | Ca** | Cu*** | Fe**** | Pb** | Mg** | Mn*** | K** | Na** | Zn*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/7/81 | Surface | <0.005 | 2.20 | <0.01 | 0.05 | <0.05 | 0.65 | 0.03 | 0.45 | 1.15 | <0.01 |
| 1/7/81 | Deep | " | 2.20 | " | 0.02 | " | 0.65 | 0.02 | 0.50 | 1.20 | " |
| 1/12/81 | Surface | " | 2.15 | " | 0.06 | " | 0.70 | 0.02 | 0.40 | 1.15 | " |
| 1/12/81 | Deep | " | 2.30 | " | 0.02 | " | 0.65 | 0.02 | 0.45 | 1.10 | " |
| 1/26/81 | Surface | " | 2.10 | " | 0.09 | " | 0.30 | 0.03 | 0.45 | 1.50 | " |
| 1/26/81 | Deep | " | 2.25 | " | 0.06 | " | 0.25 | 0.02 | 0.45 | 1.55 | " |
| 2/2/81 | Surface | " | 2.15 | " | 0.28 | " | 0.25 | 0.02 | 0.55 | 1.60 | " |
| 2/2/81 | Deep | " | 2.15 | " | 0.08 | " | 0.20 | 0.02 | 0.45 | 1.60 | " |
| 2/9/81 | Surface | " | 2.20 | " | 0.04 | " | 0.25 | 0.04 | 0.45 | 1.50 | " |
| 2/9/81 | Deep | " | 2.25 | " | 0.09 | " | 0.25 | 0.02 | 0.50 | 1.55 | " |
| 2/16/81 | Surface | " | 2.50 | " | 0.07 | " | 0.30 | 0.01 | 0.45 | 1.60 | " |
| 2/16/81 | Deep | " | 2.25 | " | 0.08 | " | 0.65 | 0.02 | 0.45 | 1.45 | " |
| 2/23/81 | Surface | " | 2.80 | " | 0.52 | " | 0.60 | 0.02 | 0.90 | 2.40 | " |
| 2/23/81 | Deep | " | 2.10 | " | 0.05 | " | 0.25 | 0.01 | 0.45 | 1.45 | " |
| 3/4/81 | Surface | " | 2.20 | " | 0.08 | " | 0.25 | 0.01 | 0.75 | 1.75 | " |
| 3/4/81 | Deep | " | 2.30 | " | 0.04 | " | 0.25 | <0.01 | 0.45 | 1.50 | " |
| 3/9/81 | Surface | " | 2.20 | " | 0.40 | " | 0.25 | 0.01 | 0.55 | 1.55 | " |
| 3/9/81 | Deep | " | 2.35 | " | 0.06 | " | 0.25 | 0.01 | 0.45 | 1.45 | " |
| 3/16/81 | Surface | " | 2.05 | " | 0.07 | " | 0.20 | 0.01 | 0.45 | 1.80 | " |
| 3/16/81 | Deep | " | 2.15 | " | 0.10 | " | 0.25 | 0.01 | 0.65 | 1.55 | " |
| 3/26/81 | Surface | " | 2.30 | " | 0.10 | " | 0.50 | 0.01 | 0.55 | 1.55 | 0.06 |
| 3/26/81 | Deep | " | 2.20 | " | 0.09 | " | 0.35 | 0.01 | 0.50 | 1.45 | <0.01 |
| 3/26/81 | Surface | " | 2.20 | " | 0.09 | " | 0.30 | 0.01 | 0.55 | 1.60 | <0.01 |

Appendix B. (Con't)

| SAMPLE DATE | INLET | Cd* | Ca** | Cu*** | Fe**** | Pb** | Mg** | Mn*** | K** | Na** | Zn*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/30/81 | Deep | <0.005 | 2.15 | <0.01 | 0.05 | <0.05 | 0.25 | 0.01 | 0.45 | 1.45 | <0.01 |
| 4/8/81 | Surface | “ | 2.10 | “ | 0.12 | “ | 0.20 | “ | 0.70 | 1.65 | 0.01 |
| 4/8/81 | Deep | “ | 2.00 | “ | 0.02 | “ | 0.25 | “ | 0.45 | 1.45 | <0.01 |
| 4/17/81 | Surface | “ | 2.30 | “ | 0.11 | “ | 0.35 | “ | 0.80 | 1.85 | 0.01 |
| 4/17/81 | Deep | “ | 2.05 | “ | 0.06 | “ | 0.20 | “ | 1.50 | 2.00 | 0.01 |
| 4/21/81 | Surface | “ | 2.05 | “ | 0.03 | “ | 0.20 | “ | 0.60 | 2.40 | <0.01 |
| 4/21/81 | Deep | “ | 2.30 | “ | 0.14 | “ | 0.50 | “ | 0.65 | 1.65 | 0.01 |
| 4/27/81 | Surface | “ | 2.15 | “ | 0.28 | “ | 0.30 | “ | 0.55 | 1.50 | <0.01 |
| 4/27/81 | Deep | “ | 2.10 | “ | 0.06 | “ | 0.30 | “ | 0.45 | 1.45 | “ |
| 5/7/81 | Surface | “ | 2.55 | “ | 0.14 | “ | 0.30 | “ | 0.50 | 1.45 | “ |
| 5/7/81 | Deep | “ | 2.05 | “ | 0.07 | “ | 0.25 | “ | 0.45 | 1.40 | “ |
| 5/13/81 | Surface | “ | 2.20 | “ | 0.05 | “ | 1.90 | “ | 0.45 | 1.00 | “ |
| 5/13/81 | Deep | “ | 2.30 | “ | 0.10 | “ | 0.55 | “ | 0.50 | 0.90 | “ |
| 5/25/81 | Surface | “ | 2.20 | “ | 0.07 | “ | 0.40 | 0.02 | 0.50 | 1.50 | “ |
| 5/25/81 | Deep | “ | 2.20 | “ | 0.06 | “ | 0.30 | 0.03 | 0.40 | 1.40 | “ |
| 6/8/81 | Surface | “ | 2.20 | “ | 015 | “ | 0.30 | 0.01 | 0.40 | 1.00 | “ |
| 6/8/81 | Deep | “ | 2.30 | “ | 0.10 | “ | 0.30 | 0.01 | 0.40 | 1.10 | “ |
| 6/15/81 | Surface | “ | 2.00 | “ | 0.06 | “ | 0.30 | 0.01 | 0.40 | 1.20 | “ |
| 6/15/81 | Deep | “ | 2.20 | “ | 0.39 | “ | 0.30 | 0.02 | 0.65 | 1.90 | “ |
| 6/23/81 | Surface | “ | 1.90 | “ | 0.08 | “ | 0.30 | 0.01 | 0.50 | 1.40 | “ |
| 6/23/81 | Deep | “ | 2.20 | “ | 0.10 | “ | 0.30 | 0.01 | 0.55 | 0.90 | “ |
| 6/29/81 | Surface | “ | 1.90 | “ | 0.07 | “ | 1.20 | <0.01 | 0.40 | 0.80 | “ |
| 6/29/81 | Deep | “ | 2.20 | “ | 0.10 | “ | 0.65 | 0.01 | 0.40 | 0.90 | “ |
| 7/10/81 | Surface | “ | 1.90 | “ | 0.15 | “ | 0.40 | <0.01 | 0.55 | 1.20 | “ |
| 7/10/81 | Deep | 0.009 | 2.80 | “ | 0.12 | “ | 0.40 | <0.01 | 1.20 | 2.80 | 0.02 |

Appendix B. (Con't)

| SAMPLE DATE | INLET | Cd* | Ca** | Cu*** | Fe**** | Pb** | Mg** | Mn*** | K** | Na** | Zn*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/24/81 | Deep | <0.005 | 2.20 | <0.01 | 0.08 | <0.05 | 0.40 | <0.01 | 0.55 | 1.10 | <0.01 |
| 7/24/81 | Surface | " | 1.90 | " | 0.09 | " | 0.40 | <0.01 | 0.50 | 0.85 | " |
| 7/30/81 | Deep | " | 1.90 | " | 0.05 | " | 0.40 | <0.0 | 0.40 | 0.85 | " |
| 7/30/81 | Surface | " | 2.20 | " | 0.06 | " | 0.40 | <0.01 | 0.50 | 0.90 | " |
| 8/5/81 | Deep | " | 2.00 | " | 0.05 | " | 0.40 | <0.01 | 0.50 | 0.90 | " |
| 8/5/81 | Surface | " | 2.60 | " | 0.07 | " | 0.40 | <0.01 | 0.55 | 1.00 | " |
| 8/12/81 | Deep | " | 2.00 | " | 0.05 | " | 0.85 | <0.01 | 0.50 | 1.10 | " |
| 8/12/81 | Surface | " | 2.20 | 0.01 | 0.05 | " | 0.75 | <0.01 | 0.75 | 1.60 | " |
| 8/25/81 | Deep | " | 1.90 | <0.01 | 0.15 | " | 0.50 | <0.01 | 0.40 | 0.80 | " |
| 8/25/81 | Surface | 0.005 | 2.10 | 0.01 | 0.08 | " | 0.50 | <0.01 | 0.55 | 1.00 | " |
| 9/2/81 | Deep | <0.005 | 1.90 | <0.01 | 0.08 | " | 0.50 | <0.01 | 0.50 | 0.90 | " |
| 9/2/81 | Surface | <0.005 | 2.50 | <0.01 | 0.08 | " | 0.40 | 0.01 | 0.55 | 1.10 | " |
| 9/11/81 | Deep | <0.005 | 2.00 | <0.01 | 0.04 | " | 0.40 | <0.01 | 0.40 | 0.90 | " |
| 9/11/81 | Surface | <0.005 | 2.20 | <0.01 | 0.09 | " | 0.40 | 0.01 | 0.50 | 1.00 | " |
| 9/18/81 | Deep | 0.008 | 2.00 | 0.01 | 0.09 | " | 0.40 | <0.01 | 0.50 | 0.95 | " |
| 9/18/81 | Surface | 0.008 | 2.00 | 0.01 | 0.09 | " | 0.40 | <0.01 | 0.40 | 0.85 | " |
| 9/24/81 | Deep | <0.005 | 2.20 | <0.01 | 0.04 | " | 0.55 | <0.01 | 0.40 | 0.75 | " |
| 9/24/81 | Surface | <0.005 | 2.20 | <0.01 | 0.07 | " | 0.70 | 0.01 | 0.55 | 0.90 | " |

* ±0.005
** ±0.05
*** ±0.01
**** ±0.02

Date _____

| at/Pond _____ | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 1 | 2 | C.B. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| earing Space ($ft^3$) | | | | | | | | | | | | | | | | |
| ond Volume ($ft^3$) | . | | | | | | | | | | | | | | | |
| ond Flow (cfs) | | | | | | | | | | | | | | | | |
| urnovers/hr | | | | | | | | | | | | + | | | | |
| DI (pond constant) | | | | | | | | | | | | | | | | |
| LI (pond constant) | | | _ | | | | | | | | | | | | | |
| pecies | -~ | | | | | | | | | | | | | | | |
| /lb. | | | | | | | | | | | | | | | | |
| ond Weight | | | | | | | | | | | | | | | | |
| Fish | | | | | | | | | | | | | | | | |
| otal Length (mm) | | | | | | | | | | | | | | | | |
| Mortality previous period) | - | | | | | | | | | | | | | | | |
| Mortality | | | | | | | | | | | | | | | | |
| ensity ($lb/ft^3$) | | | | | - | | | | | | | | | | | |
| DI | | | | | | | | | | | | | | | | |
| LI | _ | | | | | | | | | | | | | | | |
| B.W. Fed | | | | | | | | | | | | | | | | |
| eed Size | | | _ | | | | | | | | | | | | | |
| eedings/Day | | | | | \| | | j | | | | | | | | | |

omments: D.O. in_____ D.O. out_____

Appendix C. McCall hatchery Information Sheet

Appendix D. McCall Hatchery Necropsy Report Form

MCCALL HATCHERY
NECROPSY REPORT

A. Pond (General)

1.) Date_____ 2.) Pond_____ 3.) Water stage _____

4.) Pond size_____ 5.) Flow _____ 6.) Pounds in pond_____

7.) Date last cleaned_____ 8.) Cleaning frequency _____

9.) Pond mortality_____

B. Fish (General)

1.) Species_____ 2.) Age _____ 3.) Length _____

4.) Weight_____,5.) Condition factor_____ 6.) Date last handled,

7.) Diet_____ 8.) Pellet size _____ 9.) Feed rate_____

10.) Feed frequency_____

C. Water Condition & Chemistry

1.) Clear 2.) Turbid 3.) Water color _____

4.) Temperature 8AM_____5PM 5.) D.0. _____ 6.) pH _____

7.) Zn_____ 8.) Cu_____ 9.) Fe _____ , 10.) Cd_____

11.) Mn_____ 12.) Pb_____ 13.) Ca _____ 14.) Mg _____

15.) Na, _____ 16.) K_____ 17.) Other _____

D. Comments

E. Fish Condition

1.) General appearance_____

2.) Arrangement in water_____

3.) Body surface_____

4.) Operculum_____

5.) Fins (indicate fins damaged)_____

6.) Caudal Peduncle_____

7.) Eyes,_____

8.) Mouth cavity_____

9.) Gills_____

10.) Thymus_____

11.) Musculature_____

12.) Body cavity_____

13.) G.I. tract_____

14.) Pyloric caeca_____

15.) Liver_____

16.) Spleen_____

17.) Gall bladder_____

18.) Air bladder _____

19.) Sex organs_____

20.) Kidney_____

21.) Heart_____

F. Other Signs or Conditions Noted



Performed by: _____